WHAT IS CLAIMED IS:

| 1 | | 1. | A method for manufacturing a trench-type MOSFET, the method | | |
|----|---|--|---|--|--|
| 2 | comprising: | | | | |
| 3 | | provid | ding a semiconductor substrate and forming a trench on the | | |
| 4 | semiconductor substrate; | | | | |
| 5 | | formi | ng a first oxide layer on a bottom and sidewalls of the trench and on | | |
| 6 | the semicond | onductor substrate; | | | |
| 7 | | formi | ng a bottom anti-reflective coating (BARC) layer in the trench to | | |
| 8 | cover the first | irst oxide layer; | | | |
| 9 | | forming a photoresist layer on the bottom anti-reflective coating layer; | | | |
| 10 | removing the photoresist layer; | | | | |
| 11 | | remov | ving the bottom anti-reflective coating layer; and | | |
| 12 | | remov | ving the first oxide layer on the sidewalls of the trench to form a | | |
| 13 | bottom oxide layer on the bottom of the trench. | | | | |
| 1 | | 2. | The method of claim 1 wherein providing the semiconductor | | |
| 2 | substrate and forming the trench comprises: | | | | |
| 3 | | formi | ng a pad oxide layer, a silicon nitride layer, and a mask oxide layer | | |
| 4 | sequentially on the semiconductor substrate; and | | | | |
| 5 | | remov | ving portions of the pad oxide layer, the silicon nitride layer, the mask | | |
| 6 | oxide layer, a | nd the | semiconductor substrate to form the trench. | | |
| 1 | | 3. | The method of claim 2 wherein removing the portions is performed | | |
| 2 | by a photolith | ograph | y process and an etching process. | | |
| 1 | | 4. | The method of claim 2 further comprising after removing the | | |
| 2 | portions: | | | | |
| 3 | forming a sacrificial oxide layer on the sidewalls of the trench; and | | | | |
| 4 | | remov | ving the sacrificial oxide layer. | | |
| 1 | | 5. | The method of claim 4 wherein the sacrificial layer is formed by | | |
| 2 | thermal oxidation. | | | | |
| 1 | | 6. | The method of claim 4 wherein the sacrificial oxide layer is | | |
| 2 | removed by e | tching. | | | |

| 1 | 7. The method of claim 1 wherein the first oxide layer is formed by | | |
|----|--|--|--|
| 2 | chemical vapor deposition (CVD). | | |
| 1 | 8. The method of claim 1 wherein the bottom anti-reflective layer is | | |
| 2 | formed by deposition. | | |
| ۷ | formed by deposition. | | |
| 1 | 9. The method of claim 1 wherein the bottom anti-reflective layer is | | |
| 2 | removed by etching. | | |
| 1 | 10. The mostle defeation 0 colonia the bettern anti-material leaves in | | |
| 1 | 10. The method of claim 9 wherein the bottom anti-reflective layer is | | |
| 2 | removed by etching using a chemical compound which contains sulfuric acid. | | |
| 1 | 11. The method of claim 1 wherein the first oxide layer is removed by | | |
| 2. | etching. | | |
| | | | |
| 1 | 12. The method of claim 11 wherein the first oxide layer is removed by | | |
| 2 | etching using a chemical compound which contains hydrofluoric acid. | | |
| 1 | 13. The method of claim 1 further comprising depositing a polysilicon | | |
| 2 | layer in the trench after removing the first oxide layer on the sidewalls of the trench. | | |
| 2 | layer in the trenen after removing the first oxide layer on the sidewans of the trenen. | | |
| 1 | 14. A method for manufacturing semiconductor devices, the method | | |
| 2 | comprising: | | |
| 3 | providing a semiconductor substrate having a trench on the semiconductor | | |
| 4 | substrate; | | |
| 5 | forming a first oxide layer on a bottom and sidewalls of the trench and on | | |
| 6 | the semiconductor substrate; | | |
| 7 | forming a bottom anti-reflective coating (BARC) layer in the trench to | | |
| 8 | cover the first oxide layer; | | |
| 9 | forming a photoresist layer on the bottom anti-reflective coating layer; and | | |
| 10 | removing the photoresist layer, the bottom anti-reflective coating layer, and | | |
| 11 | the first oxide layer on the sidewalls of the trench to form a bottom oxide layer on the | | |
| 12 | bottom of the trench. | | |
| | | | |
| 1 | 15. The method of claim 14 wherein providing the semiconductor | | |

substrate having the trench comprises:

| 3 | forming a pad oxide layer, a silicon nitride layer, and a mask oxide layer | | | | |
|---------|--|--|--|--|--|
| 4 | sequentially on the semiconductor substrate; and | | | | |
| 5 | removing portions of the pad oxide layer, the silicon nitride layer, the mask | | | | |
| 6 | oxide layer, and the semiconductor substrate to form the trench. | | | | |
| 1 | 16. The method of claim 15 further comprising after removing the | | | | |
| 2 | portions: | | | | |
| 3 | forming a sacrificial oxide layer on the sidewalls of the trench; and | | | | |
| 4 | removing the sacrificial oxide layer. | | | | |
| 1 | 17. The method of claim 15 further comprising depositing a polysilico | | | | |
| 2 | layer in the trench after removing the first oxide layer on the sidewalls of the trench. | | | | |
| 1 | 18. A method for manufacturing semiconductor devices, the method | | | | |
| 2 | comprising: | | | | |
| 3 | providing a semiconductor substrate having a trench on the semiconductor | | | | |
| 4 | substrate; | | | | |
| 5 | forming a first oxide layer on a bottom and sidewalls of the trench and on | | | | |
| 6 | e semiconductor substrate; | | | | |
| 7 | forming a bottom anti-reflective coating (BARC) layer over the first oxide | | | | |
| 8 | layer, the bottom anti-reflective coating layer filling the trench; | | | | |
| 9 10 | forming a photoresist layer on the bottom anti-reflective coating layer; and removing the photoresist layer, the bottom anti-reflective coating layer, are | | | | |
| 11 | the first oxide layer on the sidewalls of the trench to form a bottom oxide layer on the | | | | |
| 12 | bottom of the trench. | | | | |
| 12 | octom of the trenen. | | | | |
| 1 | 19. The method of claim 18 wherein providing the semiconductor | | | | |
| 2 | substrate having the trench comprises: | | | | |
| 3 | forming a pad oxide layer, a silicon nitride layer, and a mask oxide layer | | | | |
| 4 | sequentially on the semiconductor substrate; | | | | |
| 5 | removing portions of the pad oxide layer, the silicon nitride layer, the mas | | | | |
| 6 | oxide layer, and the semiconductor substrate to form the trench; | | | | |
| 7 | forming a sacrificial oxide layer on the sidewalls of the trench; and | | | | |
| 8 | removing the sacrificial oxide layer. | | | | |

- 1 20. The method of claim 18 further comprising depositing a polysilicon
- 2 layer in the trench after removing the first oxide layer on the sidewalls of the trench.